

A WEB SURVEY IMPLEMENTATION FRAMEWORK: EVIDENCE-BASED DESIGN PRACTICES

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Abstract

Web surveying is growing in acceptance and use. However, web-based surveys appear to have lower response rates than traditional mail surveys. That may be the result of ineffective strategies for web survey implementation. This work puts together a set of important aspects to be taken into account through several phases of web survey implementation. The resulting framework has been developed to guide researchers in building a successful web survey implementation and is structured in terms of software tool selection, questionnaire design and survey administration phases. Research foundations and delivery concerns are also included in a framework to guide researchers in building an instrument able to increase response rates. Particular attention is given to key design practices under the evidence of their contribution for a successful web surveying implementation.

Keywords: survey research, web surveys, online surveys, web questionnaire design.

1 INTRODUCTION

The evolution and generalized adoption of web browsers has provided significant opportunities to conduct surveys using the web. The relative low cost of a web survey made it an easier way for data collection than telephone or face-to-face surveys. Thus, web survey is worth to consider as an alternative to other classic survey modes (Couper & Miller, 2009). However, web surveys appear to have lower response rates than comparable mail surveys. Little information on effective strategies for increasing response to web-based surveys appear to be one motive for that lower response rate (Crawford, Couper, & Lamias, 2001). To develop an effective strategy, we need first to understand what are the similarities and differences of the web survey when compared to other survey methods.

Any survey method has to deal with two major issues: participants' identification and data capture technique. It is possible to distribute a questionnaire on the street, in a newspaper, or by random mail shots. The questionnaire can be randomly e-mailed to members of a general mailing list or placed on a public access website. Neither of those techniques allow for a real control over who responds. Follow-up or reminders are usually impossible and response rates hard to calculate. The control is possible by issuing passwords by e-mail which allow selected participants to gain one-off access to a closed web site. A similar password issuing procedure is possible by mail or telephone. Relatively to the data capture technique, face-to-face or telephone interviews may be recorded and transcribed to be later analysed by qualitative software tools. However, this is a lengthy process. Data analysis is easier and faster when data is captured electronically at the source, for example, fulfilling specially designed forms. Other techniques like telephone voice menu systems, e-mailed text, web forms or mailed interactive software packages also allow the capture of electronic data, speeding data analysis and reducing transcription errors. The control that the researchers want to have over the order of question completion, the type of data that can be collected, the time of the data collection and the overall survey cost are issues that are decisive to choose the data capture method (Wyatt, 2000). These are some of the reasons why web-based surveys are becoming more and more attractive when compared to classic survey methods.

Web-based surveys may be attractive when global audience is important or large numbers of participants are involved, respondents have a rare condition, data need to be collected repeatedly or automatically linked to certain data definitions, data collection and analysis time need to be short, or cost control is important. Web-based surveys also support rapid checking of responses, the use of multimedia, the enforcement of branching between questions and rapid updating of questionnaire content. On the other hand, web-based surveys main disadvantages concern the generality and validity of their results. Generality may be a problem because population is clearly restricted to those who are keyboard and Internet literate, which today are 28% of the world population. This percentage is higher in Europe with 58.4% or in North America with 77.4% and lower in Asia with 21.5% or Africa with 10.9% (Internet World Stats, 2010). Validity can also be a concern because it may not be easy to understand by certain respondents what it is required of them (Wyatt, 2000). The simple translation from paper format to web format may lead to significant changes in the perception of what the questions and answers mean and, consequently, affect the validity of the survey. A constant problem in surveys is reduced response rates. This may be due to a certain survey fatigue, lack of recognition of usefulness, reduced personal motivation, difficult questionnaire interpretation or sense of use of excessive time and effort. All of these problems may also affect web surveys and in general, electronic surveys.

A study on the use of electronic surveys has revealed that the reduction of costs (i.e., postage, phone charges), the use of electronic mail for pre-notification or follow-up purposes, and the compatibility of data with existing software programs were the most positive aspects of email and web surveys. Nevertheless, this study, which involved 62 experienced survey researchers from the American Educational Research Association, has also revealed some concerns regarding the sample representativeness of the population and the authenticity of the respondents as well as issues of confidentiality and lack of privacy in using email and web survey modes. Sound principles for survey construction and administration are then required in order to mitigate these concerns (Shannon,

Johnson, Searcy, & Lott, 2002). An effective strategy for web surveying must therefore take them in account.

Another important concern to take in account while developing an effective strategy for web surveying is the nonresponse. We need to understand possible response behaviors in order to minimize nonresponse. Complete responders (survey completed), item nonresponders (survey partially completed) and unit nonresponders (survey not answered) has been a traditional categorization for response behaviours in the absence of mechanisms to get better insight in the response process. However, in the web, the survey process can be traced automatically using metadata and paradata to go beyond a limited categorization of three behaviours. Using the web, besides complete responders, item nonresponders and unit nonresponders, four other behaviors can be addressed: answering drop-outs, lurkers, lurking drop-outs and item non-responding drop-outs. Answering drop-outs are the respondents that having provided some answers, quit before completing the survey; lurkers are the ones that go through all the survey without providing any answer. Lurking drop-outs are the individuals that go through the survey without answering any question and also quit before reaching the end of the survey. Finally, item non-responding drop-outs are the respondents that quit before the end of the survey having answered some of the questions. A higher differentiation of response behaviors should allow for a better strategy to increase response rates. In fact, a web survey involving almost one and a half thousand respondents has shown a quarter of them being answering drop-outs, lurkers or lurking drop-outs (Bosnjak & Tuten, 2001). To be effective, a strategy for web surveying should take into consideration these behavioural patterns.

The framework presented in this paper is the result of our research on guidance for web survey implementation. Our work started with one of the most referenced papers about web survey implementation; the three criteria and the eleven principles for constructing web surveys (Dillman, Tortora, & Bowker, 1999). Our paper highlights nine of those eleven main design principles and practices. We considered then complementary best practices on web-based surveys design that were identified using keywords like “survey research”, “web survey”, “online survey”, “web questionnaire design” to search relevant academic citation indexing and search services. Other implementing aspects addressed in the framework are only briefly presented and may be extended in a future work. The principles and practices to be used in web survey implementation as shown in the framework are of two kinds: evidence-based and non evidence-based. Some of these practices result of systematic empirical research which provided statistically significant evidence of being effective. Yet, others practices are mostly based on the experiences of generations of practitioners, and much of it had no valid scientific evidence.

Anyway, we believe such an instrument should be useful to prevent researchers and practitioners from overlooking important issues when developing a web survey strategy. And since web questionnaire design is a key issue for the success of such strategy, particular attention has been given in this paper to some related principles namely the ones supported by evidence-based practices.

2 THE FRAMEWORK

The implementation of a survey goes through several steps where questionnaire development is an important step but not the only one. As a research method to collect information from a selected group of people using standardized questionnaires or interviews, a survey requires attention to sampling procedures, pre-testing instruments usage, delivery methods, ensuring validity, and analyzing results among other steps (Pennsylvania State University, 2006).

The framework provides an overall picture of main issues to be considered in a web survey implementation (Figure 1). Building upon the research foundations consisting of goals, resources, timeline, and sampling procedures, the framework is structured into three phases: tool selection, questionnaire design and survey administration. The framework calls also into light concerns on how to deliver the survey regarding the respondent’s computer expertise, graphical interface and data security.

The first web survey implementation phase is the tool selection. Relevant selection criteria include language flexibility, workflow possibilities, real time options, available services, reporting capabilities, metadata features, design features, data extraction facilities, flexibility, ease of use, price and limitations. The WebSM site provides access to data regarding almost four hundred software tools for web surveys. Some of them are free of charge, others have free limited versions charging for extended versions and prices can go over \$20.000. Some solutions may even be integrated with telephone (Centre for Methodology and Informatics, 2011).

The second phase is the web questionnaire design. Web surveys have several specifics when compared to paper surveys. Some design practices from a multidisciplinary approach have already been put forward to increase web surveys effectiveness (Laboratory for Automation Psychology at University of Maryland Institute for Advanced Computer Studies, 2011). Those design practices will be discussed in some detail in the following section.

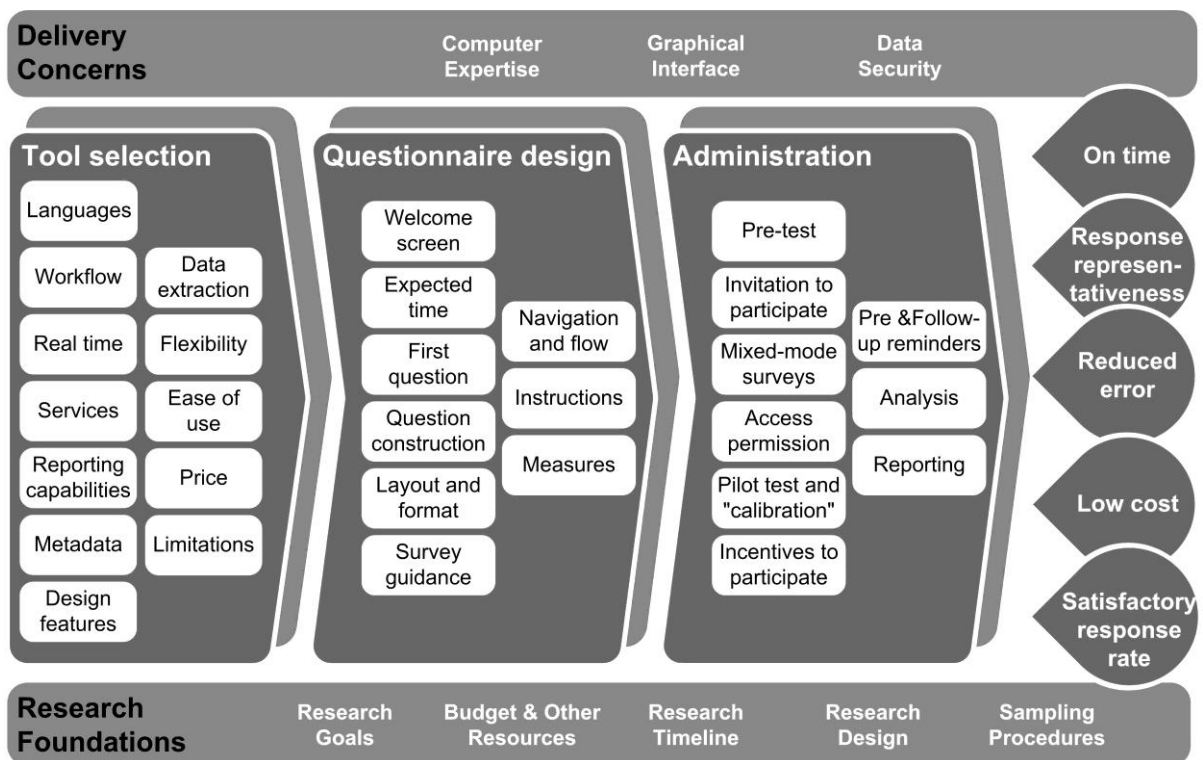


Figure 1. Web Survey Implementation Framework.

The last phase is the survey administration that encompasses a set of initiatives to improve survey effectiveness particularly focused on increasing the validity and reliability of the survey as well as the respondent's participation (Solomon, 2001). Pre-test of the web survey by a special invited group of people, a pilot test and the use of calibration questions are some of those initiatives. The use of a mixed-mode survey approach, combining several means (web, phone, paper) may also be considered. Attention should be given to pre and follow-up reminders to participants, adequate incentives to participate and even permissions to access the questionnaire like a password (Gunn, 2002). Some basic analysis and reporting should be easily provided by the web survey tools for a better control of the survey administration. Overall we seek answers on time, satisfactory response rate, response representativeness, and reduced errors in a low cost global process.

Important delivery concerns of the web survey to the respondents are also highlighted in the framework. One should take into account the possible inability of some respondents to receive and to respond web questionnaires either because of computer expertise or because of issues with the graphical interface linked to software features, equipment, browser type or transmission limitations

(Dillman, et al., 1999; Redline & Dillman, 1999). For example, web surveys should be designed for the least compliant browser, so that all respondents would have the same visual stimulus (Dillman & Bowker, 2001; Gunn, 2002). Data security on the server or the network should also not be overlooked (Gunn, 2002).

In the framework, at the bottom, we have the research foundations to guide the options in the several phases. For instance, design features like the ones regarding navigational paths or sample requirements as determined by research goals and research design restrict the tool selection options.

3 WEB QUESTIONNAIRES DESIGN PRACTICES

Presented as hypotheses for the development of respondent-friendly web questionnaires, many principles to be followed in the web design process remain untested (Dillman, et al., 1999). Table 1 presents some excerpts from a literature review on questionnaire design research which tested some principles or practices. As it can be seen, research findings support some of those “best” practices. Others, “... do not lend strong support to the principles tested” and should be deeper tested. As this table is not covering all web survey principles, there are others which were not tested at all and so, not listed here.

This section discusses some of those principles in the light of the collected or missed evidence so far.

3.1 Welcome Screen

The use of a welcome screen to motivate respondents is important. It should emphasize the ease of responding and how to navigate through the web questionnaire pages (Gunn, 2002). The welcome screen is the proper place to do emphasize the salience of the subject (Sheehan & McMillan, 1999). When Web survey results are less salient, response rates tend to be both slightly lower and also more highly variable. The welcome screen may also include other aspects like the scope of the survey, the involved partners (with the associated hyperlinks), the language selection and data security or anonymity concerns.

3.2 Expected Time

Unit nonresponders represent respondents which refuse to answer. This behaviour may be due to lack of motivation, lack of opportunity or ability (respondent may not have access to the questionnaire) or it may have not been possible to process the information. Another reason that is usually suggested to justify the unit nonresponders behaviour is that people may not have the time to answer the questionnaire (Bosnjak & Tuten, 2001).

Twenty minutes is a common value for a survey. Nevertheless respondents should be informed of the expected time to complete the questionnaire as closest as possible to an average, realistic value. Otherwise, if the expected time is too optimistic, respondents may drop out before completing the questionnaire (Crawford, et al., 2001).

3.3 First Question

The importance of the first question was underlined by several studies. This question should be interesting, related to the topic of the survey, completely visible on the first screen and easy to answer. This question should be answered by everyone and should not be used for filtering questions (Gunn, 2002). Nevertheless, evidences are still missing. It was not yet proved that the use of a fully visible first question will lead to lower dropout rates for a web-based survey (Healey, Macpherson, & Kuijten, 2005).

Topic	References	Statements	B/E (*)
Welcome screen	Sheehan and McMillan 1999	“Hypothesized relationship between issue salience and response rate ... were generally supported”.	E
Expected time	Healey, Macpherson and Kuijten 2005	“reports the results of a research project that tested ... principles relating ... the use of graphical symbols conveying point to completion” ... “The results do not lend strong support to the principles tested”	B
	Crawford, Couper and Lamias 2001	“Those who were told the survey would take 8 to 10 minutes completed an average of 8.43 minutes before dropping out compared to an average of 9.67 minutes for those who were told the survey would take about 20 minutes ($t=1.54, ns$).”	E
First question	Healey, Macpherson and Kuijten 2005	“reports the results of a research project that tested ... principles relating ... the structure of the first question” ... “The results do not lend strong support to the principles tested”	B
Question construction	Redline, Dillman Baxter and Creedy 2005	“...shows that four... characteristics have a significant effect on the errors of omission when all forms are considered together: high number of question words, high number of answer categories...” “These can be thought of as strong determinants of error, and included requiring a write-in response, having a high number of answer categories”	E
Layout and format	Dillman, Tortora, Conradt and Bowker 1998	“using a plain questionnaire without color and html tables, which required less transmission time and was done in a more conventional questionnaire format, provided better results than a fancy version”	E
	Healey, Macpherson and Kuijten 2005	“reports the results of a research project that tested ... principles relating ... the use of double banking for multiple response questions” ... “The results do not lend strong support to the principles tested”	B
	Bowker and Dillman 2000	“One of the most obvious and consistent findings in this study is the general lack of difference - across several dimensions - afforded by the two formats...” (left and right oriented) “...particularly in the distributions of the questionnaire items.”	E
Instructions	Conrad, Schober and Coiner 2007	“The studies presented here demonstrate that enabling web survey respondents to engage in the equivalent of clarification dialogue can improve respondents’ comprehension of questions and thus the accuracy of their answers, much as it can in human-human interviews.”	E

Table 1. Web questionnaire design research statements (*) B: Best practice; E: Evidence-based research finding.

3.4 Question Construction

Lines explicitness and length adequacy are two of the question construction issues. Respondents appear less likely to miss words if lines are kept short. Shorter lines assure that each respondent is receiving a similar word stimulus. On the other hand, lines with short length will decrease the

probability of screen problems in the respondent's browser. Designer should define columns on a table as a percentage of the browser screen width (Dillman, et al., 1999). Frary provides several tips for designing quality questionnaires, specially about question and response alternatives construction, that can also be used at Web survey design (Frary, Assessment, & Evaluation, 1996).

Branching errors may also happen if question complexity is high. Question complexity may include high number of question words, high number of answer categories, last categories branch, all categories branch, write-in responses, location at the bottom of a page, and high distance between the answer box and branching instruction. The influence of the question complexity (high complex if twelve or more words) and number of answers categories (high if four or more) has been studied on respondents' reading and comprehension of the branching instructions at self-administered questionnaires. Results show that question complexity had a tendency to increase the failure to skip when instructed to skip (commission error) and the failure to advance to the next listed question on the page and answer it when directed not to skip (omission errors) (Redline, Dillman, Carley-Baxter, & Creecy, 2005).

However, even if the development and presentation of well structured questions is essential, this aspect (which one?) or the length of the questionnaire should not be overvalued. Studies showed that attracting people to the web-based survey is more important when it comes to increase response rates (Archer, 2007).

3.5 Layout and Format

The potential effects of visual presentation on survey responses are one of the main interests in either paper or web-surveys. Results from some experiments embedded in a general population survey provide substantial evidence that the visual design of questions (graphical and verbal manipulations) in self-administered paper surveys affects respondents' behaviour regardless of age, educational attainment, and sex. For instance, the number box versus polar point scalar questions and the use of different sized open-ended answer spaces resulted in findings that suggest that it is the visual design that was influential across demographic sub-groups. Check-all-that-apply versus forced choice formats also affected almost all demographic groups (the exception was men and respondents over 60) (Stern, Dillman, & Smyth, 2007).

Nevertheless there are similarities between paper and web surveys as well as important specificities. The use of images and other visual materials has an increasing interest in web-surveys (Couper, 2005). Web-surveys designers use html tables, multiple colours, motion and other features, like dynamic html, animation, java-applets, and sound tracks, to try to get better answers from respondents. They also tried to develop questionnaires easily answerable by computer-literate respondents, usually using formats quite different from those typically used in paper questionnaires (Dillman, Tortora, Conradt, & Bowker, 1998). Nevertheless, the use of visual effects should be used with caution. Some results suggest that using a plain questionnaire without colour and html tables, which required less transmission time and was done in a more conventional questionnaire format, provided better results than a fancy version of that questionnaire (Dillman, et al., 1998).

An experiment aiming to measure the differences in the effect of one versus multiple-page design in a web-survey evidenced that questionnaire completion time for the multiple-page design was 30% longer than one page design. This was justified because each page had to be downloaded from the server and answers to every survey question uploaded separately to the server (Manfreda, Batagelj, & Vehovar, 2002).

Traditional paper questionnaires placed the numbers and answer boxes on the left as significant number of web surveys. Other layout issue is to know if this tradition should be applied to web-surveys even they are much different from paper surveys. Studies suggest that either format (left or right oriented screens) produces pleasing outcomes with respect to item response rates and the quality of measurement (Bowker & Dillman, 2000).

3.6 Survey Guidance

The use of graphical symbols or words may give a sense of progression in the questionnaire to prevent some people of getting tired and give up even though there are only a few questions left (Dillman, et al., 1999). This progress information can be implemented by using the scroll bar if the questionnaire is not a screen-by-screen approach, using a special “progress bar” or other more creative design approach. Simpler ways may use a numerical language approach like: “question 05 of 20” or just “5/20”. Other symbols, like arrows, may be used to assist guide the respondent during the survey questions. Web-based surveys have an extraordinary advantage on this feature. Nevertheless, studies haven’t proved so far that the use of a point of completion indicator will increase completion rates in a web-site based survey (Healey, et al., 2005).

A progress indicator can be used but may have a negative effect when progress is too slow. An alternative is to inform respondents of just some key progress points along the questionnaire. Fancy web designs should be avoided since they take longer to download requiring respondents to spend more time on the web questionnaire (Dillman, et al., 1998; Gunn, 2002).

3.7 Navigation and Flow

Some flow features of web survey are unique and unavailable for other methods such as drop-down menus. Nevertheless, web surveys should avoid excessive navigational controls (Dillman & Bowker, 2001). Respondents should not be required to provide an answer to each question before being allowed to answer any subsequent ones. Moreover, asking them to scroll through past questions may be a source of frustration (Dillman, et al., 1999).

The tendency to ignore branching instructions has been already studied. The question complexity influences the extent to which respondents correctly follow branching instructions. Question complexity had a greater tendency to increase errors of commission more than errors of omission (Redline & Dillman, 1999; Redline, et al., 2005).

3.8 Instructions

Adequate instructions are essential towards to inform the respondents for the required computer actions, like, erasing radio buttons, operate a scroll bar to see the entire question, specific use of a clicker mouse button, drop-down menus, and entering mode of open-ended questions (Dillman, et al., 1999; Gunn, 2002). Studies demonstrate that bringing features of human dialogue to Web surveys can improve respondents’ comprehension of questions and thus the accuracy of their answers, much as it can in human–human interviews (Conrad, Schober, & Coiner, 2007).

Branching instructions are specific instructions that if not correctly followed result in errors of commission or omission. Several variables may influence the ability of respondents to correctly follow the branching instructions and so cause some of these errors: being the last question on a page; all answer options were directed to branch; write-in answers were requested; answer categories alternated between being directed to branch and continue; high number of answer categories; high number of words in the question; the last answer category contained a branching instruction; high distance between check box and branching instruction (Redline & Dillman, 2002; Redline, et al., 2005).

3.9 Measures

An effective measurement of the answers is essential to survey analysis phase, its easiness and achievement. A simpler answer structure is usually the better approach. It is advisable to be prudent with question structures which may have measurement problems, such as check-all-that-apply or open-ended questions (Dillman, et al., 1999; Gunn, 2002). Avoid asking participants to rank responses and to avoid response scale proliferation, i.e., if it is possible to have a 5 point scale, do not use a 10 point scale.

Two important technology trends in survey data collection are related with measurement. One is the move from discrete surveys to continuous measurement; the other, the move from data only, to data, metadata and paradata. The first trend is related with the growth of portable devices and mobile computing, like mobile phones, allowing for the growth and extension of continuous measurement in surveys. Unlike traditional interviewing that, because of budget reasons, maximize the occasion to collect large amounts of data at a single point in time, or if a panel is used, at relatively extended intervals, Web-based surveys, using computers anywhere, laptop computers, tablets, mobile phones, Blackberries and other devices, allow the move from discrete surveys to continuous measurement (Couper, 2005). Moreover, the facilities of the cloud computing, where shared servers provide resources, software and data to computers and other devices on demand, let web-surveys to be dynamically scalable and a virtualized resource. The other trend is the move from data only, to data, metadata and paradata. Metadata explains the data, with details like the codes associated with answer options, the description of the relevant questions and the flow of the instrument, providing broader descriptions of the study itself. Paradata, data about the process, such as keystrokes files, audit trails or timestamp data, allows for the evaluation of the respondent's behaviour what may lead to a better understanding, for example, of reasons to quit the questionnaire. A Web-based survey example with paradata measurement and respectively analysis is the study made by Archer (Archer, 2007).

4 CONCLUSIONS

The increasing use of web-surveys, an alternative to traditional mail or phone surveys, presents new challenges. To address them and assure high response rates, a framework has been developed to guide researchers in building a successful web survey implementation. The framework puts together a set of key issues identified in a literature review that were organized into three phases: tool selection, questionnaire design and survey administration.

Paying particular attention to the second phase, the questionnaire design, some principles have been discussed looking for evidence to support their contribution for a successful web-survey implementation. Some evidence has been provided for the use of a welcome screen, indication of expected time, use of a first question to be answered by everyone, guidelines to keep questions simple to understand, caution on using visual effects, indication of progress in answering the survey, freedom for navigation and flow, and adequate instructions, especially for branching.

Despite the challenges, the acceptance and use of web surveys is growing. However, considerable research has still to be carried out on the effectiveness of the adoption of some principles in developing a successful web survey implementation.

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